

Patent Claims

1. High voltage resistant edge structure in the edge region (RB) of a semiconductor component

- 5 • having a semiconductor body (1), at whose first surface (3) at least one inner zone (2) of the first conductivity type is adjacent,
- having at least one floating guard ring (15) of the second conductivity type arranged in the inner zone (2), and
- having inter-ring zones (16) of the first conductivity type respectively arranged in
- 10 the inner zone (2), which are allocated in pairs to each floating guard ring (15), these inter-ring zones being arranged laterally such the [sic] they separate two respective consecutive floating guard rings (15) from one another,
- characterized in that
- the conductivities and/or the geometries of the floating guard rings (15) and/or of the
- 15 inter-ring zones (16) are set such that their free charge carriers are totally depleted when blocking voltage is applied.

2. High voltage resistant edge structure as claimed in claim 1,
characterized in that

- 20 the width (r1...r5) of the inter-ring zones (16) increases in the direction of the semiconductor component and/or the width (d1...d4) of the floating guard rings (15) decreases in the direction of the edge of the semiconductor component.

3. High voltage resistant edge structure as claimed in one of the preceding claims,
25 characterized in that
- the floating guard rings (15) or the inter-ring zones (16) respectively comprise the same width.

4. High voltage resistant edge structure as claimed in one of the preceding claims,

characterized in that

the depth (t1...t3) of the floating guard rings (15) decreases in the direction of the edge of the semiconductor component.

- 5 5. High voltage resistant edge structure as claimed in one of the preceding claims,

characterized in that

the floating guard rings (15) have a U-shaped or V-shaped cross-section.

6. High voltage resistant edge structure as claimed in one of the preceding claims,

10 characterized in that

at the outermost edge of the edge region (RB) of the semiconductor component, at least one space charge zone stopper (14,14',14'') is provided.

7. High voltage resistant edge structure as claimed in claim 6,

15 characterized in that

the space charge zone stopper (14,14',14'') has a heavily doped region (14'') of the first conductivity type that is arranged in the inner zone (2).

8. High voltage resistant edge structure as claimed in one of the claims 6 or 7,

20 characterized in that

the space charge zone stopper (14,14',14'') has a damage implanted region (14'') that is arranged in the inner zone (2).

9. High voltage resistant edge structure edge structure [sic] as claimed in one of the claims 6 to 8,

25 characterized in that

the space charge zone stopper (14,14',14'') has an electrode (14') that is metallic or that contains polysilicon, which is connected to the inner zone (2).

10. High voltage resistant edge structure as claimed in one of the preceding claims,
characterized in that
at least one magnetoresistor (17) is provided at the inner edge of the edge region (RB)
of the semiconductor component.

5

11. High voltage resistant edge structure as claimed in claim 10,
characterized in that
at least one of the magnetoresistors (17) is simultaneously a gate electrode (11) of the
semiconductor component.

10

12. High voltage resistant edge structure as claimed in one of the claims 10 to 12,
characterized in that
at least the outermost magnetoresistor (17) is nearly completely enclosed by a cathode
metallization (10) in the direction of the first surface (3) of the semiconductor
component.

15

13. High voltage resistant edge structure as claimed in claim 12,
characterized in that
the cathode metallization (10) is the metallization of the source electrode (10) of the
semiconductor component.

20

14. High voltage resistant edge structure as claimed in one of the preceding claims,
characterized in that
the cross-section of the inter-ring zones (16) in the edge region (RB) is constructed so
as to be tapered to the first surface (3).

25

15. High voltage resistant edge structure as claimed in one of the preceding claims,
characterized in that
the semiconductor component is a vertical power transistor or an IGBT.